REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1 and 3-25 are pending in the present application. Claim 1 is amended by the present amendment.

In the outstanding Office Action, Claims 1-14, 18-19, and 21-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi et al. (Japanese Patent Application No. 04-046024, herein "Fumiyoshi") and Sato et al. (U.S. Patent No. 5,228,894, herein "Sato"); Claim 15 was rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi and Sato; Claim 16 was rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi, Sato, and Takeshi (Japanese Patent Publication No. 8-133767); Claim 17 was rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi, Sato, and Japanese Patent Application No. 63-310735; and Claim 20 was rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi and Sato.

Applicants note that the outstanding Office Action, at page 1, item 9, indicates that the specification is objected to. However, the body of the outstanding Office Action does not mention any grounds supporting the objection and Applicants believe that the objection was presented in error. Accordingly, it is respectfully requested the next Office Action indicates that the specification is in order.

Claims 1-14, 18-19, and 21-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Fumiyoshi and Sato. That rejection is respectfully traversed.

Independent Claim 1 is amended to recite that a glass optical element is manufactured "with no grinding or polishing." The claim amendment finds support in the specification, for example at page 1, prenumbered paragraph [0002]. No new matter is believed to be added.

Briefly recapitulating, independent Claim 1 is directed to a method for manufacturing a glass optical element having at least one concave surface with no grinding or polishing. The method includes softening a glass molding material, molding the softened material with a first mold and a second mold, applying a pressure to the softened material when the first mold and the second mold are at temperatures above a glass transition temperature, cooling the first mold and the second mold so that temperatures of the molds reach temperatures equal to or lower than the glass transition temperature, and removing the cooled glass from either of the first or the second mold. During cooling, a second temperature of the second mold reaches the glass transition temperature prior to a time when a first temperature of the first mold reaches the glass transition temperature.

As discussed in the specification at page 6, prenumbered paragraph [0014], a lens with a concave surface tends to deform "in a direction reducing the radius of curvature of the concave face" (or a concave face with the smaller radius of curvature when two concave faces exist) during the cooling step. The method of Claim 1 solves this problem by a novel process that achieves with no grinding or polishing accurate surface properties of the faces of the lens, as recited in Claim 1 and shown in Figure 13.

Turning to the applied art, Fumiyoshi discloses the use of a pair of dies at different temperatures.[1] Specifically, Fumiyoshi discloses in the context of a first example shown in Figures 1(a)-(d) and Figure 2 that (English translation provided by the Applicants):

> such the control, for example, is realized by making the temperature of one die 12 at pressing start between glass transition temperature to {strain point temperature minus 50 degree centigrade}, which also being 20 degree higher than the temperature of the other die.

[1] Fumiyoshi, page 5, left upper column, lines 6-10, or at page 3, column 6, lines 33-37, of the Patent No. 2,579,036 issued from the patent application of Fumiyoshi.

In other words, Fumiyoshi discloses that, when the pressing starts, a temperature of a first die is between the glass transition temperature and the strain point temperature minus 50°C, and a second die has a temperature 20°C lower than the temperature of the first die. Thus, according to Fumiyoshi, the dies are applied to melted or softened glass material when the dies have temperatures lower than the glass transition temperature and the pressing is performed under the same condition.

Applicants submit it was known in the art at the time of Fumiyoshi that melted or softened glass material pressed by dies having lower temperatures than the glass transition temperature produces sink marks on the glass surface due to a high temperature difference between an inside of the glass and the surface thereof. In fact, the occurrence of serious sink marks on the glass surface is unavoidable as long as such temperature range of the dies is applied. Fumiyoshi solves this problem partially by making the sink marks occur only on one surface of the molded glass. In other words, Fumiyoshi sacrifices the accuracy of a first surface of the glass (lens) for an accurate second surface. In this way, Fumiyoshi produces a lens that has one imperfect surface that requires post-processing, such as grinding or polishing, to remove the sink marks.[2]

The outstanding Office Action states at page 2, item 4, that "Fumiyoshi inherently teaches that in the cooling step, the second temperature of the second mold reaches the glass temperature prior to a time when a first temperature of the first mold reaches the glass transition temperature." However, Applicants respectfully submit that is not the case as the dies in Fumiyoshi cannot reach the glass transition temperature during cooling because both dies in Fumiyoshi have a temperature below the glass transition temperature, as discussed above. Even if one would consider the heat transfer from the melted glass to the dies, it is

[2] Fumiyoshi, page 2, left lower column, lines 8-13.

doubtful, and certainly is not required or inherent, that the dies would be heated by the melted glass to reach the glass transition temperature.

Further, Fumiyoshi shows in Example 1 that dies made of a same material are controlled at different temperatures and shows in Example 2 that dies with different thermal conductivities are controlled with a same temperature. Thus, Fumiyoshi does not teach or suggest that one die will reach the glass transition temperature before the other die because of the different thermal conductivities of the dies.

In addition, the outstanding Office Action recognizes at page 3, item 5, that "Fumiyoshi does not teach that the pressing begins when the molds are at temperatures above the glass transition temperature." The outstanding Office Action relies on Sato for teaching that feature and states "[i]t would have been obvious to a person of ordinary skill in the art ... to time the pressure application of Fumiyoshi to start when the molds are hotter than Tg because Sato et al taught that excellent release properties could be expected."[3] Applicants traverse that basis for the outstanding rejection. Sato discloses that a superior releasing property is obtained not by applying a temperature hotter than the glass transition temperature to the molds, but by making the upper mold less hotter than the lower mold during pressing and cooling.[4] Therefore, an "upper-mold-adherence phenomenon" is prevented according to Sato and the teachings of Sato do not have anything to do with the pressing.

Applicants submit one of ordinary skill in the art would understand the teachings of Fumiyoshi as applying to pressing melted glass with molds having temperatures below the glass transition temperature to obtain a first face of a lens having defects and a second face of the lens being free of defects. In addition, Applicants submit one of ordinary skill in the art would understand from the teachings of Fumiyoshi that the lens surface having defects must

[3] Outstanding Office Action, page 3, item 5.
[4] Sato, column 10, lines 24-47, column 11, lines 51-54.

be processed by various mechanical procedures to remove those defects. On the other hand, Applicants submit one of ordinary skill in the art would understand the teachings of Sato as suggesting using molds having temperatures far above a glass transition temperature and using a lower mold that is hotter than an upper mold for better releasing the upper mold.

Therefore, one of ordinary skill in the art would have found no motivation or reason to combine the teachings of Fumiyoshi and Sato because these references teach contradictory temperatures and different working principles.

Further, Applicants submit if one of ordinary skill in the art would have chosen the mold temperatures above the glass transition temperature as in Sato and would have applied those temperatures to the dies of Fumiyoshi, there is no reason or motivation to make a temperature difference between the upper and lower dies because sink marks would have been less likely to occur. Further, if one of ordinary skill in the art would have applied different temperatures between the upper and lower molds to prevent the "upper-mold-adherence phenomenon," based on the teachings of Sato, then the lower mold would be hotter than the upper mold. Thus, the dies of Fumiyoshi shown in Figures 3 and 4 would have a temperature condition different than the condition of Claim 1 therein, and thus would be contradictory to the teachings in Fumiyoshi.

Accordingly, it is respectfully submitted that one of ordinary skill in the art would not have combined the teachings of Fumiyoshi and Sato as suggested in the outstanding Office Action and independent Claim 1 and each of the claims depending therefrom patentably distinguish over the applied art.

Regarding the outstanding rejections on the merits of Claims 15, 16, 17, and 20, because those claims depend either directly or indirectly from independent Claim 1, which is

believed to be allowable as discussed above, Applicants respectfully submit that Claims 15, 16, 17, and 20 are also allowable.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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